13. *Some Insects associated with the Plant Gnidia* (*Arthrosolen*) *laxa* Gilg.—By A. J. Hesse, B.Sc., Ph.D., F.E.S., Assistant, South African Museum, Cape Town.

(With Ten Text-figures.)

Introduction.

In this paper an attempt is made to enumerate the different kinds of insects directly or indirectly dependent on *Gnidia laxa* during the autumn and summer months of September 1931 to May 1932.* The life-histories and stages in the life-cycle of some of those, found biologically or biocoenotically dependent, are here given for the first time. The study is necessarily limited in its scope, and is solely an attempt to show what interesting biological data could be obtained from the study of an ordinary plant like *Gnidia*. In its scope it does not purport to be an exhaustive list and neither does it attempt even to outline or solve all the intricate and complex relationships, biochemical, physiological, and chemo-physical problems bound up with any detailed biocoenotic or ecological study. It is more a study of the members of an interdependent group.

The study of insects and their host plants, apart from the economic point of view, has received but scant attention in South Africa. With the exception of a few common forms, the life-histories, larval stages, and pupae of but few are known. In the sphere of systematic entomology, which in itself demands all the attention of the student, very little time is available for the more interesting study of the habits, bionomics, ecology and life-histories of our rich indigenous fauna. If this, my attempt on a single plant, could awaken the interest of amateurs and students of insect life in this direction, its object would be more than achieved. As a matter of convenience the paper is divided into a general section dealing with the insects and the plant, and a descriptive part in which the larvae, pupae, and adults of new species are described for the first time.

* A season which was, however, more humid, with more frequent showers than either 1930 or 1933.—Author.

General.

The Plant, its Parasites and their Parasites.

All over the Western Province, particularly the Cape Peninsula, Stellenbosch and Somerset West, there thrives on more or less open country, in open and uncultivated patches or alongside roads, a somewhat straggling, sparse-leafed shrub. This plant *Gnidia* (*Arthrosolen*) *laxa* Gilg., a member of the *Thymeleaceae*, prefers gravelly soil and is more common on burnt patches, where it soon becomes abundant and luxuriant if not pressed out by its relative *Passerina vulgaris* or by the more vigorous "Renosterbos" (*Elytropappus rhenocerotis*), both of which also seem to flourish best in such areas. *Gnidia laxa* is found all the year round, but begins to flower in March and April. The normal shrub ranges in height from 1 foot to 2 feet, but vigorous plants may reach a height of 3 feet. When wandering through a patch of *Gnidia* the observer cannot help noticing that a large percentage of the plants possess peculiar thickened stems, which are often so common that one is inclined to attribute them to a normal condition. These stem thickenings assume various shapes, and no two stems are identical in these enlargements. They are either short subgall-like and some considerable distance away from the ground, more elongated, whip-like or snake-like and thickened from directly above the ground to the branches, *i.e.* uniformly thickened; or with enlargements extending even half-way up subsidiary branches and twigs; or, lastly, they are subnormal, only slightly thickened. On closer examination, it will be found that many of the older stems have scattered over them, here and there, small circular holes or perforations, the exit-apertures of some stem-loving insect. If any thickened stem be now plucked up and slit longitudinally, it will be found that the pith region of the stem is hollowed out by the galleries of numerous beetle larvae. In a single stem there are often, during September and October, numerous larvae, pupae, and recently emerged adult beetles. This little brownish-black beetle, known as *Hoplitopales lineatus* Boh. (text-fig. 1), passes the greater part of its life-history feeding and developing in the pith of *Gnidia laxa*. The beetle is a member of the great family *Curculionidae*, many of which are stem feeders.

The stem of the plant in an advanced stage of infection, when split longitudinally, shows numerous larvae, each larva (text-fig. 2) is isolated by itself in a central tunnel or gallery along the pith or axis of the stem, where it may be seen feeding either head downwards or upwards. In advanced stem-infection one larva may be separated from another only by its collection of excrementa or frass-pellets, which in older stems practically occupy the entire pith-region. As the larva progresses the central gallery becomes gradually wider, but the maximum width is soon reached and the greater part of the tunnel is of the same width, only a very small part tapers to an indistinct point, showing the progress of the very young larva. As a certain number of moults takes place in the life of the larva, one may conclude that the moults in the latter part of its existence are not accompanied by a marked increase in size but are probably more metabolic in nature. Another explanation, which is more probable, is that after a certain stage the larva does not only eat its way forwards, but begins to enlarge its tunnel along the sides as well, never, however, exceeding a certain maximum and specific diameter.

During the prepupal stage it ceases to tunnel straight ahead, but bores to the periphery of the stem till it reaches the bark, and in this exit-gallery, just under the bark, it may pupate. This, however, does not always take place. Many larvae, after having completed the exit-gallery, turn backwards again towards the main tunnel, thus blocking up the exit with frass. When now they pupate in this exit-gallery or even in the main tunnel, the consequences are disastrous to the ensuing adult beetles, for it appears that many such adults are unable to find their way out through the frass plugging up the exits. The newly emerged adult is very pale-brown and presumably remains some time under the bark, before it perforates this to escape. The circular perforations outside on the stem are the escape-holes of the adults. The beetles emerging in the main tunnels cannot escape and many of these are thus found dead and firmly lodged in the mass of larval frass. This is especially the case in old, heavily infested stems.

The deaths of adults are, however, not always due to this fact, but many, especially in the case of heavily infested stems, may also be ascribed to the predatory nature of a small mite *Pediculoides ventricosus*, which is known to parasitise many other insects. This mite probably finds its way in through the escape-holes of successful beetles and, wriggling through the frass pellets, may reach a neighbouring tunnel containing a pupa or a freshly emerged beetle. The female mites become attached to the softer abdomen of the beetle and there develop into small spheres, the mouth-parts of which are firmly embedded in the tissues of the beetle. The entire abdomen of the beetle subsequently resembles a bunch of grapes, owing to the visible distended and spherical abdomens of numerous mites.

From the end of October to the end of June, and possibly the rest of the winter months, no pupae or adults are found in the stem and the winter appears to be spent in the larval stage. The adults of this beetle have never been taken by me outside the stem of *Gnidia* and the larval and pupal periods are not exactly known, but the pupal period is probably short. The percentage of infested plants in any one patch is often considerable, and so striking is this in certain small areas that one is apt to mistake this stem-thickening as natural to the plant. Extensive areas are, however, not always very heavily infested. The most heavily infested patches which I have seen are those of plots within the municipal areas of Somerset West, which have been burnt and lain fallow for years. Plants bordering footpaths and alongside gravelly roads often show a marked infestation and striking stem-enlargements. The powers of flight of the adult beetles are probably limited and the emergence of any considerable number in any one isolated patch will result in a very heavy infection.

It is difficult to state in what way infection disturbs the natural luxuriance and growth of the plants. By nature the shrub seems to be a straggler, is usually sparse-leafed and does not grow to any appreciable height. Infested plants are, however, as a rule, more vigorous than uninfested ones. It is possible that, as in the case of animal metabolism, diseased condition is often marked by an increased catabolic activity. There is no doubt that the stimulus applied by the larvae of this beetle is conducive to very vigorous growth on the part of *Gnidia*. The stem-thickenings produced belong to what Kuster termed the "*Histoid*" galls, namely, galls formed as a result of tissue malformations in contrast to "*Organoid*" galls due to organ abnormalities such as flowers, leaves, etc. He further subdivided the histoid formations into "*hyperplasmatic*" and "*hypertrophic*" galls. The former differs from the latter in that abnormal division and proliferation of tissue cells and not abnormal enlargement of individual cells take place. It is under the kataplasmic type of the hyperplasmatic galls, where tissue differentiation resembles normal tissue, that these stem-thickenings fall. This development of stem tissue is probably attributable to the same cause that underlies gall formations in general, and in this case may also be due to the cumulative effect of a series of different infections. Tissue proliferation is due to the physiological activities of insect larvae, which may be chemical and enzymatic, physical or traumatic in reaction. The true causative agent of all gall formation has, however, never been isolated, and it is a problem which demands elucidation at the hands of experimental biology. Traumatic reaction and tissue injury in the case of other plants have, however, been demonstrated as causative agents in extreme catabolic activity. The injury caused by the feeding larvae of *Hoplitopales* may be responsible for the vigorous growth and marked stem-enlargements. Bottomley's suggestion that nucleic acid derivatives are responsible for the liberation of what is termed "*auximones*" or promotors of growth in the plant may have some significance also, where tissue destruction may affect the growth, even remotely from the locus of activity, by chemical means.

While examining the frass in the empty and abandoned galleries in dead and dry stems, the remains of imprisoned parasitic Hymenoptera belonging to the genus *Eurytoma* were also found. It is difficult to state whether this Chalcid frequents the empty galleries or whether it is actually a parasite on the beetle larvae. The fact that the remains were found in the frass points to the conclusion that this *Eurytoma* is in all probability parasitic on *Hoplitopales lineatus.*

During March a large percentage of the shrubs are also found to be infested with still another beetle larva. These larvae (text-fig. 4) belong to *Sphenoptera cupreosplendens*, a member of the *Buprestidae.* In this case also, the percentage of infested plants is very great, and, moreover, no plant infected with the Buprestid was found that was not also infected with the Curculionid. All stages of larvae are found during March and many pupae at the end of March and during April, the adult beetles emerging during April. The larvae of the Buprestid do not cause stem-thickenings and neither are they found in or near the pith region. Very young stages are frequently found boring just under the bark or in the woody tissue just under the bark, comparatively high up, about 3–6 inches above the ground. They are geotropic, eating their way downwards; the more advanced stages being found at the base of the stem and in the main roots. Throughout its course the larva remains strictly superficial, never penetrating to the pith regions of either stem or root. The galleries are flattened in conformity with the dorso-ventral compression of the larvae and are never straight throughout their length. Above the surface of the ground in the stem the galleries are very wavy, extending to one side, then to the other of the stem, forming sharp U-shaped turns. In the main root the turns are less sharp, the gallery being moderately wavy.

From the position and nature of the tunnels, as a result of the examination of a very large number of stems, the following procedure on the part of the beetle probably takes place:—

The adult beetle lays its eggs somewhere in or on the stem, about

3–6 inches above the ground. The ensuing minute larva bores through the bark or begins to tunnel just under it. At first the tunnels are very fine and narrow, becoming broader and more distinct and also more wavy as the larva grows. The method of feeding is confined to an arc in front of the enlarged prothorax and in which the head is moved from one side to the other. When the base of the stem is reached, the larva tunnels down the large thick or main root or, less frequently, down another thinner root. By this time it has become considerably larger, making a fairly broad flattened tunnel. Near the apex or thin part of the root it turns back, tunnelling upwards again on the other side of the root, more or less parallel to its downward course. When it arrives at the junction of the stem and roots, where the stem is often slightly thicker, more knob-like, it reaches the end of its larval and feeding activity. The prepupal larva slightly widens the terminus and here changes into a pupa. The entire tunnel is plugged up with frass behind the feeding larva.

Only two or three larvae in a stem eventually become adults, the rest, not finding sufficient food material in the root-system, die or pupate in the stem above the ground, from where they do not seem to be able to get out. Fully formed adult Buprestids have been found dead in such positions. It thus appears that the final stage must come to rest at the base of the stem. The usual number of beetles in a single plant is two, one on each side between the base of the stem and roots, just under or at the level of the ground. Dead and dry stems have, however, been found with three beetles in them. Should the plant die, even after the larval existence, the pupae also succumb. Many dead or dying plants, during April, had dried and shrivelled-up pupae in them. No matter how carefully a stem is plucked up, the pupae do not seem to develop into adults under artificial conditions. There seem to be unknown chemical or physical factors in control in nature, which are disturbed or absent under laboratory conditions. These conditions, among others, demand a growing plant and certain states of temperature, pressure, and humidity. The fact that plants not infested with the Curculionid have not been found attacked by Buprestids, seem to point to the conclusion that the adult Buprestids only deposit their eggs on those plants with stem-thickenings, the physiological or catabolical conditions of which have been altered and are conducive to vigorous growth.

Dependent on the existence of the Buprestid larvae there is an interesting Braconid parasite. This small Braconid is new to entomology and is described below as *Hormiopterus brachypterus* n. sp.

(text-fig. 5). This interesting parasite is unique in this genus in having short rudimentary and vestigial wings, entirely useless for purposes of flight. Six females and two males of this Braconid have been hatched from a single prepupal or mature Buprestid larvae. It is apparent that the Braconid larvae pupate after the destruction of the larval tissues. They construct carton-like or parchment-like, woolly cocoons on the site of the consumed larva; leaving only the chitinous mouth-parts as a tell-tale of their activities. How, where, and when the adult Braconid deposits its eggs in the larva is a problem still unsolved. The fact that the adult Braconid is practically apterous and is provided with a comparatively long ovipositor points to the conclusion that most of its adult life is probably spent in crawling about the neighbourhood of the stems and root bases of the plant.

The ever-recurring problem, of how the parasite knows that a plant is infested with larvae of its host or just where under the bark the victim is situated, is still unsolved and one of nature's mysteries. The larvae of *Sphenoptera cupreosplendens* never come to light, but are confined throughout their life in darkness under an intact layer of bark. The Braconid has to deposit its eggs in the living larvae, and this it has to do by pushing its sharp ovipositor through the bark and into a larva just underneath. It is the locating of the larva under an intact bark that is a mystery. The matter is not one of pure chance, for the probability of an inserted ovipositor striking home in any stem is very small indeed. There must, therefore, be other unknown factors or stimuli, which control oviposition and render the probability much greater.

The pupae and immature beetles in their resting sites are subjected to still another danger, namely, that of being also attacked by the mites *Pediculoides ventricosus.* Not only this mite, but also a species of *Tyroglyphus*, attacks and destroys the pupae by feeding on their tissues.

During April many plants are rendered leafless through the activities of a caterpillar, which feeds on the leaves of *Gnidia.* This caterpillar is green, with a lateral reddish band along the coxal parts of its legs and prolegs, with a broad yellowish band along the side just above the red band and two narrow yellowish lines on its back. It becomes full grown when it is about 18 to 20 mm. long. The caterpillar is that of a Pyralid moth *Phlyctaenodes plumbatalis* Zell., a quite common species in the Western Province. The larvae have the habit of spinning threads all over the twigs as they are feeding. These threads often connect up or join together clusters of leaves or even adjacent twigs. A certain amount of procryptic coloration, a harmonisation with the colour scheme of the background is shown. The fine twigs and some leaves are reddish to reddish-brown like the head and lateral band on the caterpillar. They also cling very closely to the twigs and their presence can often be surmised only from the presence of the silken threads.

When the larva is full grown, it becomes paler green in colour and is now ready for pupation. It now drops to the ground and enters the soil where it spins a silken cocoon, enclosing grains of sand and particles of earth. The period of pupation occupies 19 to 20 days, when the adult moth emerges. There are usually from two to four caterpillars on any one plant and these may cause considerable damage by defoliating entire branches. As a rule the caterpillars are more frequently found feeding towards the topmost part of the plants, the lower branches being still green with leaves.

Perhaps the most interesting member in this study of interdependence is a new species of a Tachinid fly, which I have described below as *Sturmia inimica* n. sp., the larvae of which are parasitic in the bodies of the caterpillars of this Pyralid *P. plumbatalis.* During April the adult female flies may be seen sitting very still and expectantly either near the head-end or clasper-end of a caterpillar. So intent are they in watching the caterpillar that these flies, normally very difficult to catch, may practically be touched with the hand. This is the time when the fly is about to deposit its eggs on the caterpillar. The period of quiessence is probably the period of preparation for oviposition. No matter how long such flies were watched, I have never been able to observe the actual act of egg-laying; disturbances in the environment, such as my own presence, a gust of wind, etc., have always frightened them away.

In the case of this Tachinid the eggs are laid outside on the cuticle of the caterpillar and usually above on the dorsum or on the sides above. The usual number of eggs laid on a single caterpillar is four, sometimes three, but of the few caterpillars found with eggs on them, no one had less than three. As a rule three eggs are laid on the pro- and meso-notum just behind the head and one at the posterior end just above the claspers, or along the side of the body opposite one of the prolegs. The three anterior ones are situated in a triangle, one on the pronotum behind the head on the left side, one a little more posteriorly on the right side nearer the base of the pronotum, and the third more or less medially on the anterior end of the mesonotum.

In one case the caterpillar had two on the pronotum and one on the side of the body. Whether all these eggs are laid by a single fly has not been observed, but the conclusion points to the fact that they are the eggs of a single female on any one caterpillar.

The eggs are very small (about $\frac{1}{2}$ mm. long) for such a comparatively large fly. They are oval, creamy-white, convex on one side and flattened on the other. They are glued on by means of some viscid secretion on the flattened sides and are very firmly lodged; neither alcohol nor formalin dissolves this substance. Caterpillars with attached eggs are not very common, and when the caterpillars themselves are not very easily seen or common, the difficulty of finding them is increased. Owing to the habit of the caterpillar of suddenly dropping in amongst the foliage on any prolonged disturbance, the fly must be fairly quick in depositing her eggs at a time. The presence of the eggs on the back of the caterpillar does not seem to interfere with its usual activity. It proceeds as usual, feeding peacefully, while burdened with these symbols of its own individual destruction and death. From the human ethical point of view there is something exceedingly repulsive in this type of destructive parasitism, where the lurking parasite devours its victim by degrees, not even granting it the slightest opportunity of fulfilling its own destination, yet allowing it, within limits, to obey and pursue its own specific urge until its hour is at hand.

The ensuing minute larva bores through the egg-shell on the glued-on side nearer one pole. It penetrates the cuticle of the caterpillar and apparently remains attached to this entrance for some time by its posterior end, thus keeping a communication with the empty egg-shell and the outside. It may leave this position under the egg-shell after a certain time, migrating elsewhere, where it perforates the cuticle again, making a new attachment and communication with the exterior. These loci of attachment are seen on the exterior of the caterpillar as dark-brown or blackish, more or less oval rings. In all the caterpillars which have been examined, there was no indication of a connection either with the tracheal system or the spiracles. Neither is the position of the parasite confined to any specific part. The larvae may be attached in the prothoracic region or the abdominal region; they may be on the side of the body opposite the prolegs or other abdominal segments or they may be found in the prothoracic region near the head, either attached dorsally, laterally or even ventrally between the legs.

The attached parasite projects into the body cavity, straight at first during the very young stages, but when they are about 1 mm. long they acquire a distinct kink in the posterior quarter of the body, thus more or less lying close to the body-wall of the caterpillar. This curvature or kink may, however, be a result of the internal pressure of the organs and distended gut of the host; the parasite thus adapting itself to occupy the minimum amount of space without causing unnecessary inconvenience to the host. The rapid growth of the larva must eventually cause organ-displacement in the caterpillar. Only one larva is destined to pupate and reach the adult stage, the others probably succumb sooner or later. It is probable that the larva which hatches first is the one to monopolise the host in the end.

One caterpillar, with five eggs attached to it, went into the soil and completed its silken cocoon. Four days later, on the cocoon being opened, the caterpillar was still unpupated and very much alive. So much so that within an hour it had closed up the incision again. Yet four days afterwards on being opened again there was a complete fly puparium and only the remains of the caterpillar-cuticle in the cocoon-case. In another case, with four Tachinid eggs attached, dissection revealed four parasites inside, the oldest being about 1 mm. long. This caterpillar did not spin a cocoon. It merely dropped to the ground, lying inert for hours, apparently dead and with only a very feeble response. It was obviously incapable of spinning a cocoon. In all probability the most advanced parasite, in this case, would eventually have destroyed all the tissues of the host to pupate in the soil as is usual in very many other *Tachinidae*, and not in the empty cocoon. It would appear in the case of this Tachinid that the larvae either pupate in the empty cocoon-cases after the destruction of the caterpillar, or that they render the caterpillar incapable of spinning by destroying it vitally before cocoon formation, in which case they merely pupate in the soil as is the case of some Tachinids like *Carcellia*. The problem, of whether pupation takes place either in the empty cocoon-case or in the soil in the life-cycle of one and the same species, or whether either the one or the other is specifically or generically confined to certain Tachinids, needs experimental elucidation. In this case it certainly appears, according to limited observations and without elaborate experimental corroboration, that ultimate pupation depends upon the period of parasitism of the caterpillar, or at what period of its life it became parasitised. If an adult fly were to deposit its eggs on a caterpillar just emerged from the last larval moult, the ensuing fly larva would have a comparatively long period within which to develop to an advanced stage and thus preclude cocoon-formation on the part of the host. On the other hand, should the eggs be deposited within a day or so prior to cocoon-formation, the caterpillar would still be vital and active enough to proceed with its final act, in which case the parasite would have to pupate in the cocoon. It must, however, be borne in mind that we are as yet totally ignorant of the stimuli or factors relevant to the existence of caterpillar-hosts, which are able to control and elicit egg-laying responses on the part of Tachinids. Neither do we know the physiological relationships between the host and parasite, which govern incubation and the period of emergence of larvae from attached eggs.

It is, however, certain, at least in this case, that some eggs on the same caterpillar hatch before others and that certain larvae inside are larger than others. Even here, however, it is impossible to state whether certain positions, even within the caterpillar, are not more favourable physiologically than others and that larvae progress more favourably when situated there. In the caterpillars mentioned above, the most active parasite was attached on the side somewhere in the region of the prolegs at about the middle of the body and not under an egg-shell. They were specimens that had migrated there.

Judging from the undisturbed condition of the body-cavity of the dissected caterpillar, it appears that these larvae, up to 1 mm. long, probably subsist only on blood-plasma and body fluids, which they obtain either through a minute and indistinct oral opening, or through "physiological filtration" and not through tissue destruction. As in the case of the majority of Tachinids, the larva probably becomes free in the body cavity to devour the fat-body and vital organs after the third instar. The empty caterpillar skin, in the case of the specimen that pupated in the cocoon, was certainly the only thing that remained over. It is also noteworthy that no frass was found in the cocoon or skin. In the case of parasites still attached, excretions, if any, will most likely be voided outside, or there may be a possibility that the darkened socket-like rim in which the posterior end of the larva is lodged, and which really corresponds to a sheath, is composed in part of excretory products and in part of the cuticle of the caterpillar. This socket-like ring has no anatomical connection with the parasite, the posterior end of the body being merely lodged or retained in position by the last circlet of segmental spines, or by the dorsal and ventral clusters of hooks mentioned in the descriptive part.

The period of incubation, the periods of the instars, and the period of pupation are at present unknown. The ensuing larva, prior to pupation, ruptures the cuticle of the host on the side. The puparium, formed by the hardening of the last larval instar, is immobile, reddish-brown, slightly darkened at the ends, more narrowed apically, is indistinctly segmented and with the posterior spiracles of the larva still visible as three bosses on each side, whereas the anterior ones are represented as a small process on each side near the cephalic end. I am unable to state whether the larvae of *Sturmia inimica* are specifically restricted to this one host or whether other species of *Phlyctaenodes* in the Cape may not also be parasitised by this fly.

Also attacking this plant externally there are at least two kinds of Coccids, both of which are, however, uncommon. One is a member of the soft-scaled group belonging to the genus *Ceroplastes*, the females of which secrete a thick, white waxy covering. One of these specimens was parasitised by four maggots of some Acalypterate fly, probably an Agromyzid, the adults of which I have not obtained. The other Coccid is much rarer and is a member of the true-scaled group belonging to the genus *Tachardia*.

Chance Visitors and Random Feeders, Defenders of the Plant, etc.

At least five different kinds of insects were also found feeding on this plant. These, namely, three kinds of *Curculionidae, Hypsomus bevinsi* Mshl., *Eremnus setifer* Boh., and *Lixus alboguttatus* Boh., one Chrysomelid, *Polystica fasciata* de Geer., and one Pentatomid bug, *Steleocoris comma* Thb., although found feeding on it, are probably not restricted to it, for they have been obtained from other plants as well. The bug has, however, a better claim to being considered as a constant feeder, owing to the presence of nymphal stages on the same shrub during April. The adults of the Buprestid borers have also been taken on the leaves during April.

Of the predaceous fauna, sometimes found among the foliage and which may be considered as defenders of it, there are two or three species of Attid spiders, which construct small silky nests among the leaves, and at least one juvenile of a species of preying Mantid (*Miomantis* sp.) common during March and April. At least one species of non-parasitic mite, a representative of the *Oribatidae*, is often found crawling about on the twigs and leaves.

Non-paying Tenants.

The empty galleries and tunnels in the dead and dried stems also harbour certain insects and spiders. A small immature Attid spider habitually frequents the exit galleries of the Curculionid, where it lines the sides with silk. The most important inhabitant of these empty galleries and tunnels is, however, a new species of Thrips, which I have described in the systematic part as *Dicaiothrips gnidiicolus* n. sp. (text-fig. 9). This Thrips is also remarkable for its rudimentary wings, which are useless for purposes of flight, and which have become functionless as a result of its cryptic habits. The entire life-history is passed inside the empty galleries and among the frass. An adult male and female and a brood of young ones are usually found in one gallery; the adjoining one being often occupied by another couple. The adults, as well as the young stages, have never been observed outside on the plant, and presumably they never leave the tunnels except to occupy adjoining ones.

The female lays a batch of eggs, about 14 to 16, on the sides of a tunnel, all with one pole pointing upwards. The eggs are glued on and are not contiguous, but separated from one another. Both sexes seem to keep guard over the eggs, somewhat after the manner of earwigs, and are loath to abandon them even when exposed to daylight. During September to October, and again in April, all stages, eggs, larvae, pupae (text-fig. 10), and adults, are found in the stems; sometimes a solitary couple and a batch of eggs in one gallery and a couple together with larvae and pupae in another. The larvae and pupae also receive the solicitude of the adult couple as in the case of the eggs. The larvae (text-fig. 10, *b* and *c*) in all stages are of a beautiful ruby-red, with dark antennae, legs, and posterior tube, and, like the adults, are negatively phototropic, trying to avoid the light by creeping and crawling away to hide in the frass.

Both adults and larvae have a peculiar gait, giving one the impression of being mechanical. Their progress is characteristic; stiff, erratic, as if on stilts, the larvae often running along and then stopping like some water-birds. The adult, on the other hand, is more deliberate in its movements, suggesting those of a scorpion; often, like a scorpion, taking up a threatening attitude with the front legs extended and the slender posterior tube slightly raised like the tail of a scorpion. The pupa is also capable of rapid progress when disturbed. There is no doubt that this Thrips does not frequent flowers, but, like many members of this group, probably feeds on vegetable or organic debris and in this case probably on fungi or micro-organisms thriving in the frass. This species may thus not be confined to the galleries in *Gnidia*, and may also inhabit crevices or other dark environments.

It is, however, different from other members of the genus which have been met with in such positions.

The interdependence of living organisms in connection with the dry stems and the empty tunnels of the beetles is further illustrated by the use that a small bee makes of these galleries. A species of *Ceratina*, a member of the carpenter-bees, uses these tunnels for building its nest. The bee in this case, contrary to the usual procedure of the carpenter-bees, does very little carpentering, confining most of its activities in this direction to trimming or patching up. The galleries already in existence are used, and in the case of two or three tunnels being practically continuous or merely separated by masses of frass, the bee removes the frass, thus making a long continuous tunnel. In some cases, however, even this is not done, the tunnels and exit-galleries being used irregularly as they are. The bee stores the tunnels with food packets composed of bee-bread, which in the former case are arranged in tiers, each packet being sealed off after an egg has been laid. More often, however, an exit-gallery is stored with a packet and the exit-hole is plugged up after an egg has been laid, each exit-gallery thus lodging a single larva or pupa. In the latter case the cells are of course naturally partitioned off by the plugs of beetle frass. The arrangement is thus primitive to a certain extent, depending solely on the nature and position of pre-existing galleries. The adult bees probably emerge at the end of September or in October, for during this period advanced pupae and empty pupal cases are found. There is another brood again in April, which is, however, represented by larvae only. The adult bee has never been taken outside, and neither was it possible to hatch it from the pupae.

Death of the Plant and its Causes.

A growing plant that is so heavily infested with the larvae of two kinds of beetles, which destroy its tissues internally, by caterpillars which often defoliate it externally, by Coccids which sap its strength, and by other insects which feed at random on its tissues and juices, is bound to succumb sooner or later, notwithstanding its diseased catabolic vigour. Probably all the factors contribute to its death, but judging from wilting and dying plants in the veld, the conclusion seems to point to the fact that the activity of *Hoplitopales* alone does not primarily cause death. The two deciding factors are the larvae of the Buprestid in the roots and the defoliation brought about by the Pyralid caterpillars. Wilting plants, when plucked up, show that the tissues under the bark of the thicker roots are practically one mass of frass, and that often three Buprestid pupae are lodged in the base of the stem. There seems to be no doubt that the Buprestid is majorily responsible for the death of flourishing plants, owing to its position in the plant, where it is injurious, causing the destruction of sap-conducting vessels.

Summary.

In summarising the data obtained for a period of six months, it is found that the existence of a single plant is thus biologically bound up with the life, habits, and life-histories of no less than 21 species, belonging to 7 orders of insects, three different kinds of mites, and two or three kinds of Attid spiders. These are as follows:—

(1) *COLEOPTERA :* Fam. *Curculionidae, Eremnus setifer* Boh., *Hypsomus bevinsi* Mshl., and *Lixus alboguttatus* Boh. Found feeding externally on the leaves and twigs. Fam. *Curculionidae, Hoplitopales lineatus* Boh. The larvae of which bore in the stem, feeding on the tissues and causing stem-thickenings, and finally pupating and emerging as adults in the stem.

Fam. *Buprestidae, Sphenoptera cupreosplendens* Cast. and Gor. The larvae of which tunnel and feed just under the bark at the base of the stem and in the roots, pupating at the base of the stem and roots.

Fam. *Chrysomelidae, Polystica fasciata* de Geer. An adult of which was taken outside on the plant.

(2) *LEPIDOPTERA :* Fam. *Pyralidae, Phlyctaenodes plumbatalis* Zell. The caterpillars of which feed on the leaves and pupate in the ground.

(3) *HYMENOPTERA :* Fam. *Eurytomidae, Eurytoma* sp. ign. Remains of which have been found in the frass and in the galleries of *Hoplitopales*, and which is most likely a parasite on the larva.

Fam. *Braconidae, Hormiopterus brachypterus* n. sp. The adults of which were bred from a prepupal larva of the Buprestid, on which the Braconid larvae feed.

Fam. *Apidae, Ceratina* sp. ign. The larvae and pupae of which have been found in nests constructed in the empty galleries in dry stems.

(4) *HEMIPTERA :* Fam. *Coccidae, Ceroplastes* sp. ign. The female of which secretes a white, waxy scale, found on the twigs.

Fam. *Coccidae, Tachardia* sp. ign. Found as brownish, irregular scales on the stems and main branches.

Fam. *Pentatomidae, Steleocoris comma* Thb. Adults and nymphs of which have been found feeding on the leaves and twigs.

(5) *DIPTERA :* Fam. *Tachinidae, Sturmia inimica* n. sp. The adults of which lay their eggs outside on the anterior or posterior end of the caterpillars of *P. plumbatalis* Zell., on which the ensuing larvae feed, finally killing the caterpillars and pupating in the caterpillar-cocoon or in the ground.

An Acalypterate fly, probably an Agromyzid, the larvae of which parasitise the Coccid *Ceroplastes*.

(6) *THYSANOPTERA :* Fam. *Idolothripidae, Dicaiothrips gnidiicolus* n. sp. The adults of which inhabit the empty galleries in dry stems in couples, depositing their eggs and rearing their larvae and pupae in them.

(7) *ORTHOPTERA :* Fam. *Mantidae, Miomantis* sp. ign. The nymphs of which are commonly found lurking among the twigs and leaves.

(8) *ARACHNIDA :* Sup. Fam. *Sarcoptoidea.* Fam. 1. *Tarsocnemidae, Pediculoides ventricosus.* Nymphs and adults of which are predaceous or parasitic on pupae and adults of the Curculionid and pupae of the Buprestid.

Fam. 2. *Tyroglyphidae, Tyroglyphus* sp. ign. Nymphs and adults of which attack the pupae of the Buprestid.

Fam. *Oribatidae.* Free living mites, representatives of which crawl about on the leaves and twigs.

Araneae : Fam. *Attidae.* Two or three adult spiders of which lurk among the foliage, even spinning or constructing silken nests among clusters of leaves. At least one species of juvenile uses the empty galleries as a refuge, lining it with silk.

Systematic.

All the figures are freehand drawings made by the author and are not necessarily to scale, but more or less in proportion.

Explanations of the lettering to the text-figures are:

A.C.	Anal cell.	M.	Mandible.
An.	Antenna.	Max.	Maxilla.
A.S.	Anterior spiracle.	Med.Sc.	Medial sclerite.
A.Se.	Abdominal setae.	M.C.	Medial cell.
A.T.	Anal tubercle.	M.Sc.	Mandibular sclerite.
A.V.	Anal vein.	Oc.	Ocellus.
Cl.	Clypeus.	O.S.	Ocellar spot.
Co.V.	Costal vein.	P.	Papilla.
Cr.V.	Cross vein.	Pa.	Palp.
C.Se.	Cephalic seta.	Ph.Sc.	Pharyngeal sclerite.
Cu.C.	Cubital cell.	P.P.	Pronotal plate.
Cu.V.	Cubital vein.	P.S.	Pigment spot.
E.	Eye.	R.	Rostrum.
El.	Elytron.	R.Se.	Rostral setae.
F.	Fold.	S.	Spiracle.
Fe.	Femur.	Se.	Posterior long setae.
Ga.	Galea.	Sp.	Spined or shagreened area.
I.Sc.	Intermediate sclerite.	T.L.	Thoracic legs.
L.	Labrum.	Tr.	Trochanter.
L.L.	Lateral lobes.	T.S.	Thoracic segments.
La.	Labium.	T.Se.	Thoracic setae.
Le.	Leg.	W.	Wing.
L.V.	Longitudinal vein.		

Order COLEOPTERA.

Family Curculionidae.

Subfamily Menemachinae.

Genus *Hoplitopales* Schoen.

H. lineatus Boh. (text-figs. 1, 2, and 3).

Larva.—White, with pale straw-coloured or yellowish head, the mandibles brownish. Shape eruciform, posteriorly slightly thickened opposite eighth segment, with no legs on thoracic region, only three pairs of rounded tubercle-like elevations being present, the anterior ones being closer together, all with a few slender, hair-like setae.

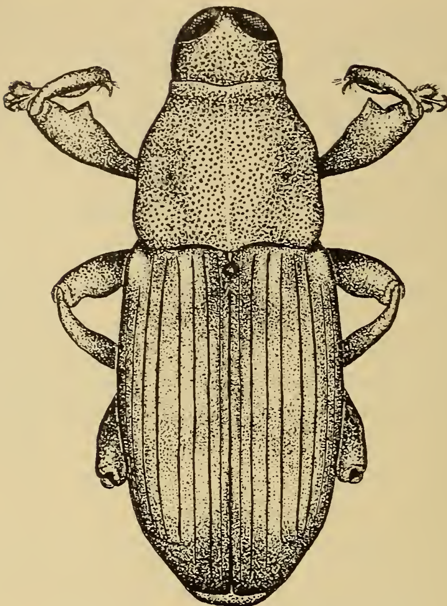
Head chitinous, exserted, with a black pigment spot on each side near the base of mandibles, with the cephalic setae as shown in text-fig. 2 (*a* and *b*); mandibles chitinous, with two teeth apically; antennae absent; maxillary palps two-jointed; labial palps two-jointed; with an indication of a central, depressed line behind labrum, and there more depressed than posteriorly.

Thorax transversely wrinkled, with the three divisions corresponding to the thoracic tubercles not very distinct; the single thoracic spiracle on the first segment chitinised, brownish (text-fig. 2, *a*).

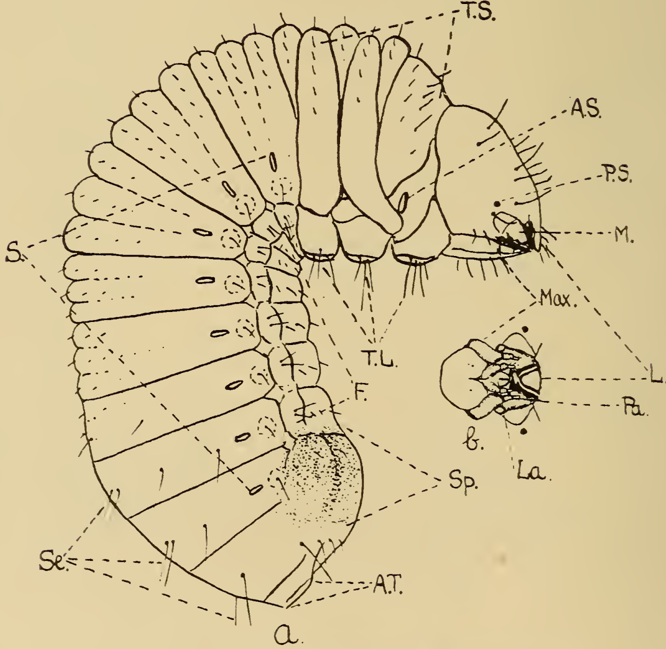
Abdomen with the nine segments only distinctly visible on sternal regions, the tergites being transversely wrinkled, with the sternal region divided from the tergal part by a lateral fold (text-fig. 2, F.), becoming indistinct on segment 8, and being elevated, more or less boss-like or knob-like opposite each segment, each tubercle bearing a very fine hair-like seta; segments 1 to 8 each with a small spiracle on each side; tergites 1 to 4 dorsally more or less divided into three transverse wrinkles, each wrinkle with a transverse row of very minute setae; segments 7–9 each with a transverse row of widely separated and much longer hair-like setae (text-fig. 2, *a*, Se.); the ninth segment terminates in a tumid tubercle-like anal process (text-fig. 2, *a*, A.T.); sternites each with a transverse row of microscopic setae, with sternite 8 much broader and more dilated laterally than the others, less shiny, dull, roughened by a distinct and much coarser micro-sculpture, composed of microscopic spines or denticles (text-fig. 2, *a*, Sp.). Length about 6–8 mm.

Pupa (text-fig. 3).—White; the eyes and mandibles dark-brownish to blackish. All the structures of the adult are already visible.

Head (text-fig. 3, *a*) with four longish setae, one on each side more



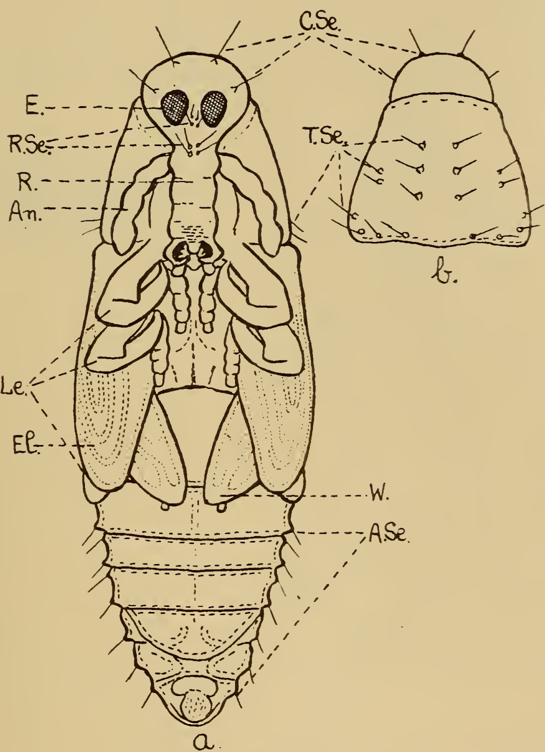
Text-fig. 1.—*Hoplitopales lineatus* Boh.



Text-fig. 2.—Larva *Hoplitopales lineatus* Boh.

laterally just behind eyes, another one further back and nearer the mid-line on each side; mandibles with two teeth; rostrum with 2 or 3 long, fine hair-like setae on each side at base between the eyes, and further forwards just behind the antennal insertions there are 2 or 3 smaller setae on each side.

Pronotum with 3 long setae on each side discally above at about



Text-fig. 3.—Pupa of *Hoplitopales lineatus* Boh.

the middle, with another one on each side at base a little more lateral to the discal ones, with 1 or 2 setae discally and laterally on each side at about the middle, and 3 or 4 on each side intra-marginally along basal angles.

Abdomen sulcated dorsally, with more or less three longitudinal rows of setae on each side of the mid-line. Length about 5–6 mm.

Distribution: Somerset West, C.P. (coll. September, October, March, and April).

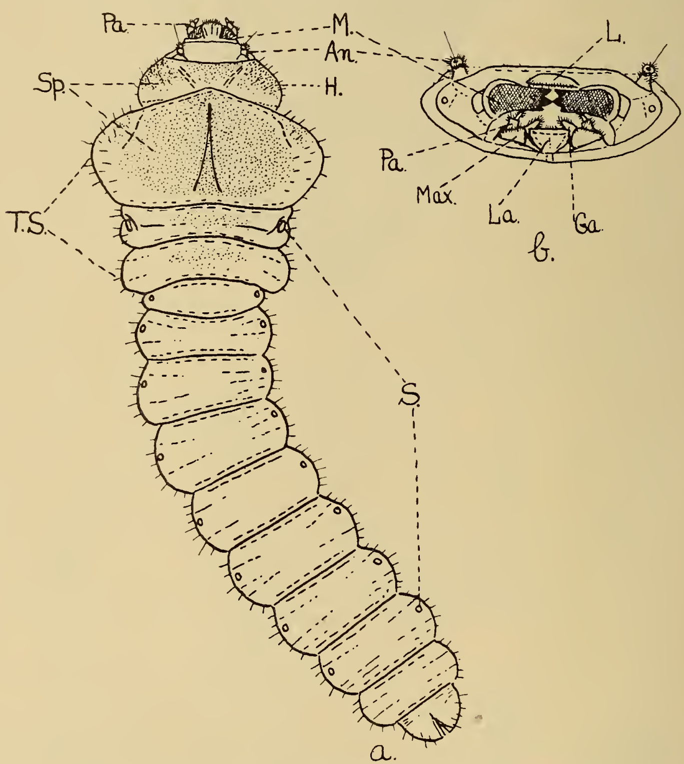
Family Buprestidae.

Subfamily Sphenopterinae.

Genus *Sphenoptera* Sol.

S. cupreosplendens Cast. and Gor.

Larva (text-fig. 4, *a* and *b*).—Body dorso-ventrally compressed, shagreened, covered with microscopic spines; white, in very young stages often with the internal parts shining through reddish (probably



Text-fig. 4.—Larva of *Sphenoptera cupreosplendens*.

due to the reddish tissue of the root under the bark); the basal part of the mouth-parts above and the lower parts of mouth reddish-brown, the apical parts often being darker, more brownish; the mandibles blackish-brown to black; antennae brownish at base, pale yellowish-white at apex; labrum pale yellowish-white, except for the lateral parts which are more brownish in advanced larvae; labium pale yellowish-white, the basal part whitish; maxillary palps translucent whitish, the lateral parts of joints 1 and 2 chitinous and brown; a central smooth impressed line on the pronotum, bifid before the middle, and a central impressed line on the sternum of the same segment chitinised and yellowish-brown, more brownish anteriorly; the spiracles chitinised and yellowish.

Head with the apical part of mouth parts above more or less sub-rugose in advanced larvae; eyes and ocelli absent; antennae rudimentary, represented laterally on each side of mouth-parts above as short two-jointed structures (text-fig. 4, *b*), the apical joint being small and subglobular, bearing one long fine seta and a crown of minute ones apically, with the basal joint smooth and setiferous apically only; labrum rotundately rounded apically, smooth above, slightly convex discally, with an indication of a central impressed line, apically with numerous short, yellowish setae; mandibles shining, bidentate apically and with a third much smaller tooth near apex on lower margin; maxillae with the palps two-jointed, the apical one slender and the basal one subglobular and with very short pale setae externally; no visible labial palps, but galeae (text-fig. 4, *b*, Ga.) visible on maxillae; labium rotundately rounded apically, with numerous short yellowish setae on apical part, discally slightly convex, with an indication of a central groove and an impressed furrow on each side, the surface feebly shagreened; mentum broad apically, its margin truncate, its base narrow and pedunculate; head broadest just before base, about twice as broad as long, the sides rounded, more rapidly narrowed apically, with the apical margin slightly emarginate medially, the upper surface more convex laterally, shagreened, more coarse and denser antero-laterally, where the spines are more distinct and longer, only a few scattered setae present.

Thorax with the pronotum the broadest part of the body, the sides much dilated and rounded or even subangularly rounded, broadest at about the middle, much dorso-ventrally compressed, with the apical margin arcuately rounded and produced over the base of head, with the dorsum more or less flattened above, the discal part opaque and shagreened, with a central impressed line, bifid from before middle, with the sides above slightly more convex and less opaquely shagreened and the isolated setae longer than those on head; prosternum also much flattened discally, opaquely shagreened discally, the anterior margin also arcuately rounded, the base straight, with the microsculpture finer than on head below, with a single central impressed line (these dorsal and ventral lines are in reality gristly or chitinous rods sunk in the skin, constituting part of the internal skeleton or tentorium to which the powerful dorso-ventral and oblique muscles are attached); mesonotum much narrower than pronotum, slightly broader or as broad as head, the surface shagreened, but shining, with a large spiracle on each side, the disk above also with a more roughened area; metanotum as broad as mesonotum, without a spiracle.

Abdomen with 10 visible segments, the ninth being partially divided, with the segments in the young stages more drawn out, longer than broad, in the advanced stages more constricted, broader than long; segment 1 often slightly narrower and shorter than the others; the first eight segments with a small spiracle before the middle on each side; the entire abdomen finely shagreened, more or less transversely wrinkled in advanced stages and provided with fine hair-like setae above on the sides and below; segment 9 with the apical division more or less smooth, conical or mammillate, perpendicularly cleft in the apical half, the lips of this cleft being often tumid.

No legs or even tubercular processes present.

Length about 11–13 mm. (mature larvae).

Max. breadth of pronotum about $3\frac{1}{2}$–4 mm.

The very young larvae from 6 mm. onwards are much more dorso-ventrally compressed and the abdominal segments are more drawn out and very extensile, capable of active worm-like movements.

Pupa resembles the adult beetle, with all the structures present. It is white, the eyes being slightly darkened, head with the eyes distinct; clypeal part distinct; the antennae are long and segmented; pronotum shaped as in the adult, smooth, but with two medial prominences on basal margin; elytra in process of development, but as yet narrow and lobate; wing rudiments as long as elytra; legs already present. The pupa is capable of slight movement.

Length about 10–11 mm.

Distribution: Somerset West, C.P. (coll. March and April).

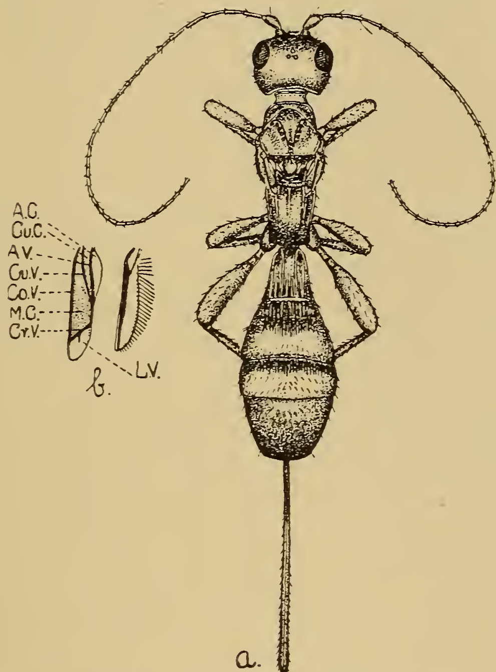
Order HYMENOPTERA.

Family Braconidae.

Genus *Hormiopterus* Giraud.

H. brachypterus n. sp. (text-fig. 5, *a* and *b*). 2 ♂♂, 6 ♀♀.

Body black, more or less shining; the ♀ with the circumoral region, mandibles (the apices excepted), a transverse arcuate band across disk of fused third abdominal segment above, a longer and often broader transverse band at about middle of segment 4, the apical margins of 5 and 6, the ventral part of sternite 1 to a certain extent, the suture between the pro- and mesopleurae, the mesosternal region in part and the knees more or less shining through reddish to reddish-brown; the



TEXT-FIG. 5.—*Hormiopterus brachypterus* n. sp.

basal half of the antennae, the apical collar-region of the pronotum, the membranes between the femora and trochanters, the extreme apices of the tibiae and the apical parts of the tarsal joints 1 to 4 more or less dirty yellowish-brown; the tegmina with the veins and apical three-fourths of medial cell sepia-brown; the minute cubital cell, anal cell, and the apex hyaline; the hind wing hyaline, with the one vein sepia-brown; the short, subrecumbent hairs and setae on the body silvery-whitish; the ♂ is coloured like the ♀, but the allotype shows more reddish on the sternal regions and the apical margins of all the abdominal segments above more or less shine through reddish.

Head subglobular, seen from above, slightly broader than long, broadest across the eyes, the sides behind the eyes rounded and narrowed to base, about as deep from above eyes to mouth as long, slightly broader across eyes than deep; vertex convexly continuous with sides and interocular part, with the integument more or less transversely rugulose and indistinctly reticulose; ocellar region in front being finer, more shagreened and the circumocular part finely shagreened; the lateral regions and cheeks below the eyes more uniformly and slightly more coarsely shagreened; frons plane or slightly depressed, finely rugulose, often more strigillose laterally; face somewhat more convex, medially below antennae, finely shagreened, finer circumorally; the fine hair on head short and scattered above and behind eyes, slightly longer and denser on face and malar space; eyes convex, small, oval, about as long as malar space, which is without a furrow; ocelli minute (much smaller than in *capensis* Brues), arranged in a triangle, raised only slightly above the surface, nearly three times as far from the eyes as from one another; antennae filiform, long, slender, with 32 to 35 joints (3 ♀♀ with 35 joints, 3 ♀♀ with 34 joints, 1 ♂ with 34 joints, and 1 ♂ with 32 joints), nearly as long as body, comparatively longer in ♂, with the first joint of scape elongate-oval, deeper than broad above, subequal to joint 1 of the flagellum along upper margin, comparatively shorter in the ♂, with one long seta and a few shorter ones below, with joint 1 of the flagellum the longest, longer in the ♂ and also subequal to joint 2, in the ♀ very slightly longer, with joints 3 to 10 shorter than 2, becoming very gradually and progressively shorter, with joint 11 to apex so gradually and progressively decreasing in length that sets of them appear subequal, the apical ones being about three times as long as thick; clypeus with the apical margin elevated and semicircularly emarginate (as in other *Cyclostomini*), with the semicircular suture and depression between it and the face distinct, with about 8 long, erect, hair-like bristles along the margin above, of which the outer ones are the longest; mandibles with the apices crossing; maxillary palps 5-jointed, comparatively long, with the setae on the lower margin of joints 2 to 4 straight and at right angles to the joints; labial palps shorter, 4-jointed.

Thorax with the pronotum just visible from above as a collar-region, with the apical part of pronotum translucent, projecting plate-like into occipital region, its anterior margin subtruncate, carinate, and slightly reflected upwards, its sides sinuous, slightly constricted, then widened and continuous with the broadly rounded propleural sides, with a transverse carinate ridge just behind middle between apex and anterior mesonotal margin, straight above and oblique on propleurae, parallel to propleural margin; propleurae shining, with curved parallel rugae on lower part and a series of irregular, short, and oblique rugae in upper corner; prosternum depressed centrally, more or less rugulose antero-laterally, shining and subshagreened discally on each side; mesonotum shining, shagreened, with the parapsidal furrows distinct, composed of shallow, subfoveate punctures, more depressed anteriorly, with the inner edges sharply marked as the middle lobe is raised anteriorly above lateral ones, with a deep and distinct middle furrow posteriorly, composed of a row of foveate punctures and only indicated as a faint depressed line just before middle, with the posterior mesonotal margin straight and with an intramarginal depressed line extending laterally round the obtusangular postero-lateral angles, with a row of separated, backwardly directed, short hairs along the inner margins of parapsidal furrows and along sides posteriorly; scutellum with the discal part convexly conical, shining, slightly shagreened near base, subcarinate laterally, with the basal furrow arcuately depressed and composed of a row of irregular foveae; mesopleurae convex medially, with the upper anterior part shining, feebly shagreened, the middle part shining, feebly shagreened, with an oblique, somewhat arcuate foveated depression delimiting the upper anterior part, with a depressed row of large punctures intramarginally along posterior margin and another less distinct row along the lower carinate margin, with the short hairs scattered and sparse; wings abbreviated, very short, narrow, with the anterior ones (text-fig. 5, *b*) lamellate, about $\frac{1}{2}$ mm. long, the apex narrowed but rounded, broadest near base, with the combined costal, subcostal, radial, and medial veins extending as a single costal vein (Co.V.) to near apex, with a short cubital vein (Cu.V.) extending obliquely to join first anal vein (A.V.) thus delimiting a large medial cell (M.C.) and a minute cubital cell (Cu.C.), with the oblique cross vein (Cr.V.) near apex often giving off a vestigial or rudimentary longitudinal vein (L.V.); hind wings narrower and slightly shorter than the front ones, the apex subacute, with only a broadened costal vein along outer side, often not quite along the margin apically, with a minute cellule basally, the inner margin with a fringe of fine, delicate ciliary hairs; mesosternum with a central depression, shining, shagreened medially, more rugulose laterally, the anterior margin carinate; propodeum shining, more or less convex, shagreened basally above, but more rugulose towards summit of declivity and more or less transversely rugulose on declivity, with the sides carinate, more so basally on each side and with three carinate ridges (the middle one being the shortest) on dorsum in basal half, with the declivity sloping, not steep; metapleurae shining, more or less shagreened discally and along upper anterior part, with irregular rugae along lower, posterior upper and posterior parts, with a punctate line next to mesopleurae, the lower margin with a tooth-like projection on each side anteriorly just behind middle coxae.

Abdomen convex above, about as long as head and thorax combined, slightly longer in the ♂, broader than the thorax, broadest across apex of segment 3 or 4; segment 1 about as long as or slightly shorter than propodeum along the side, narrow basally, then rapidly widened to spiracles, then gradually widened to apex, with the upper surface convex and (side view) slightly arched before middle, shining, shagreened, with 4 longitudinal carinate ridges above, the apical half with numerous parallel rugae or striae discally, with the sides beyond carina 4 on each side more or less perpendicular, shagreened and with a small spiracular prominence near base, the lower margin carinate; segments 2 and 3 fused together, with the suturiform articulation visible as a transverse line, more distinct laterally, and behind it a transverse depression just before the middle of the fused segments, with the combined segments about as long as or very slightly longer than 1, broadest at apex, nearly twice as broad as long in ♀, about as long as broad in the ♂, with the sides widened to apex, with the basal half longitudinally striate discally, the striae being slightly coarser and further apart, less regular at extreme base, with the discal or apical part of segment 3 more convex, shining, shagreened, the extreme apex being nearly smooth, with the sides in basal half subperpendicular, shagreened, a small spiracular prominence laterally near base, with the short, subrecumbent hairs arranged more or less in three transverse rows, the last row with an indentation medially, the posterolateral regions more finely shagreened; segment 4 broadest just behind middle, broader in the ♀ than in ♂, shorter than 2 and 3 combined and shorter than 1, transversely depressed just before middle, with the basal part longitudinally striate, the apical half shagreened, more indistinctly along hind margins, with the short hairs also in three transverse rows as on segments 2 and 3, with the sides rounded and shagreened; segment 5 in the ♀ longer than 4, its hind margin semicircularly rounded, with the integument shining, shagreened, more coarsely at base on dorsum, very nearly smooth along hind margin, with four more or less irregular transverse rows of backwardly directed and separated hairs; in the ♂, segment 5 is subequal to or slightly longer than 4; segments 6 and 7 visible in the ♂, the last small, in the ♀ they are hidden or telescoped under 5; venter more or less depressed, concave, shining, shagreened, with the basal half subcarinately raised along midline of sternites 1 and 2 in the ♀ and beyond them in the ♂; sheath of ♀ ovipositor about 2 mm. long, about as long as abdomen, dorso-ventrally compressed, narrow, the apex very slightly broader than the base, straight, shining, shagreened, with numerous short, backwardly directed hairs; last sternite or genital segment in the ♂ with three short, longitudi-carinate ridges, separating slight depressions.

Legs shining, shagreened, with short, subrecumbent hairs, denser on the tibiae below and on the tarsi, with the posterior legs the longest; posterior coxae more developed, unarmed behind, but with a triangular prominence basally below (anterior surface below); femora with the hind ones more incrassate, comparatively more so in the ♂; tarsi with the pulvilli well developed, the posterior tarsi subequal in length to the tibiae.

Length about $3\frac{1}{2}$–4 mm.

Breadth about $\frac{3}{4}$–1 mm.

Anterior wings about $\frac{1}{2}$ mm. long.

The entire brood (1 ♂ allotype, 1 ♂ paratype, 1 ♀ holotype, 5 ♀♀ paratypes) hatched from a single prepupal larva of *Sphenoptera cupreosplendens* Cast. and Gor., which was found resting in the base of root and stem of *Gnidia laxa* Gilg. Collected at Somerset West, C.P., during March 1932 and hatched in April 1932.

The cocoon-cases of *Hormiopterus brachypterus* n. sp. are elongate, more or less narrowed and attenuated to an acute point at one pole. They are composed of a delicate, translucent carton-like or parchment-like silky or woolly material. From the evidence of the cocoons it appears that the mature larvae of this Braconid pupates after the entire destruction of the Buprestid larva, occupying only the site of the Buprestid and leaving only the prothoracic tentorium and chitinous mouth parts of the Buprestid larva.

The nearest ally of this species is the only other *Hormiopterus* described from South Africa, namely, *H. capensis* Brues, with the type of which it agrees in many respects, but has rudimentary and useless wings, in which respect it also differs from the fourteen other species described from Africa. In details it differs from *H. capensis* in being smaller, in having more slender antennae, different sculptural details, etc. It shares with the European and North African *Chremylus rubiginosus* Nees, another member of the *Hormiinae*, the choice of a coleopterous host.

The type material is in the South African Museum.

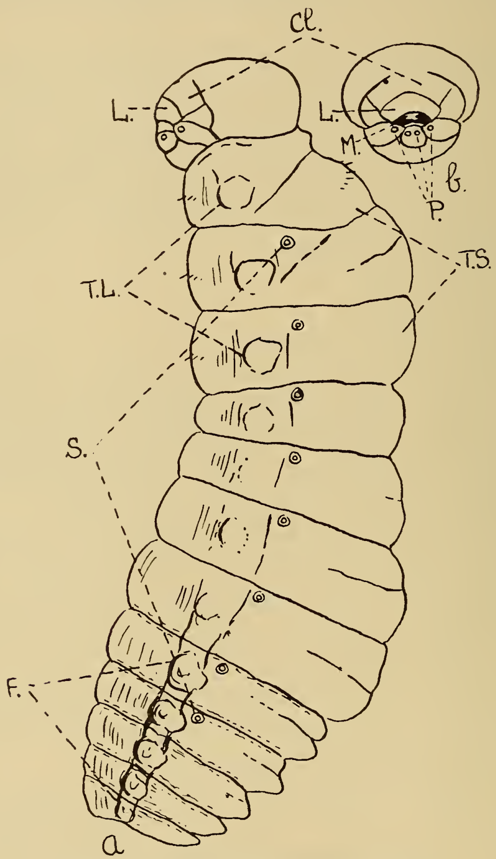
Family APIDAE.

Subfamily Ceratininae.

Gen. *Ceratina* Latr.

Ceratina sp. ign.

Larva (text-fig. 6, *a* and *b*).—White, eruciform, apodous; the apices of the mandibles pale brownish.



Text-fig. 6.—Larva of *Ceratina* sp. ign.

Head feebly chitinised, with the clypeal part broader than long, the suture between it and the head interrupted in the middle, the apical margin feebly emarginate; labrum emarginate apically; mandibles bifid apically, the lower tooth more developed and strongly chitinised; labium with a small papilla on each side; maxillae each with a small papilla; eyes, ocelli or pigment spots absent.

Thorax with the segments distinct, the pronotum divided into two, a neck region and a posterior part, all the segments with microscopic setae in transverse rows, more distinct on the pronotum and on the ventral surfaces, with a spiracle laterally on each side before the middle on meso- and metanotum.

Abdomen with 9 visible segments, more dilated and broader than the thorax from segments 2–4; segments 5–9 being progressively narrower, more transversely convex dorsally; with a lateral projecting fold on each side, more or less broken up into slight tubercles laterally on each segment, more distinct on 5–8, continued on to thorax, where there are also lateral prominences corresponding to legs; with 6 spiracles on each side from segments 1–6, and situated before the middle along anterior margins.

Length about 6–6½ mm.

Breadth about 2½ mm.

Distribution: Somerset West, C.P. (coll. in September, October, and again in April 1931–32).

PUPA.—The pupa is white, with all the characters of an adult *Ceratina* already present, but a determination of the species is impossible from even an advanced pupa, owing to the slight specific differences among the adults themselves in this genus.

ORDER LEPIDOPTERA.

Suborder HETERONEURA.

SUPER-FAMILY PYRALIDINA.

Family PYRALIDAE.

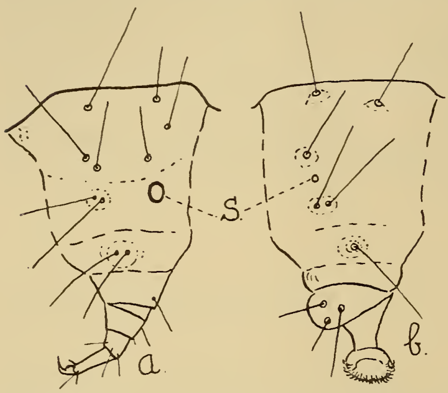
Subfamily PYRAUSTINAE.

Gen. *Phlyctaenodes* Guen.

P. plumbatalis Zell.

LARVA.—The larva of this species feeds on the leaves of *Gnidia laxa* Gilg. during March and April. They have the habit of spinning fine threads from one twig to another, or more often joining adjacent leaves or clusters of leaves together. When disturbed they often become dislodged, but hang on to the fine threads. The fully fed caterpillar becomes sluggish, drops to the ground and entering it spins a cocoon of fine silk to which adheres grains of sand and fine particles of earth. The adult moth emerges after 19 to 20 days.

Body of full-grown larva fresh-green above and below; the head, the coxal parts and the apices of the thoracic legs, the lateral parts of prominences below on segments 1 and 2, the basal parts and apices of the prolegs, lateral parts of prominences below on segments 7–9, and the claspers reddish to reddish-brown (like the tint on the twigs and on some of the leaves of the host plant); a broad lateral band above the reddish band on each side, and two narrow, longitudinal, more or less broken-up lines on the dorsum saphron-yellow to yellowish; the crochets on the legs and prolegs brownish; the setae on the head, thorax, and abdomen black and with blackish bases.



TEXT-FIG. 7.—Pronotum (*a*) and abdominal segment (*b*).
Caterpillar of *Phlyctaenodes plumbatalis.*

Head with the epicranial plates smooth, provided above with four long blackish setae on each side, one near centre opposite adfrontal plates, one laterally in same line, one on extreme side lateral to ocelli and one behind ocelli, with one shorter, finer, more pallid seta on each side medially near base, with two yellowish setae in front on each side above antennae, the apical one of which is long, with one sublateral between the 3 basal ocelli and three on each side ventrally below ocelli; frons with two longer anterior and two minute posterior yellowish setae; adfrontal plates each with a very fine seta; clypeus slightly darker than epicrania, with a yellowish seta on each side at base and another laterally on each side; ocelli 5 in number, the anterior ones (lower two) smaller; labrum with a transverse row of downwardly directed, short and stout setae near apical margin; antennae distinct, 3-jointed, the apical joint very minute, short, cylindrical, and with a minute erect seta apically, with the apex of joint 2 broad, with a long seta and a short cone medially; mentum with two medial setae; spinneret long, slender, spiniform, and with a spine-like seta in front of it; maxillary palps slender, the apical joint cylindrical.

Thorax with the pronotum (text-fig. 7, *a*) slightly more elevated than the other two thoracic segments, with five long setae on each side from above to below before the middle, two slender ones on the coxal part and three on each side in posterior part (see fig. 7, *a*), with a large circular spiracle laterally on each side, with the anterior part dorsally above duller and shagreened; meso- and metanotum each with 8 pairs of setae on each side, the lowermost pair on the coxal part and a solitary, slender seta behind the lateral pair, with no spiracles.

Abdomen with segments 1–8 each provided with 6 setae on each side, the dorsal one before the middle the longest, the second one is just behind the middle and lower down, the third is lateral and before the middle, 4 and 5 constitute a pair before the middle and subventral, the last one is stouter, has a larger black base, and is ventro-lateral on coxal part (text-fig. 7, *b*), with the spiracles on 1–7 small, situated just before middle, that on segment 8 large, larger than one on pronotum; segment 9 is the shortest segment, with 4 setae above on each side, a dorsal one, a very long postero-lateral one, and one projecting over anal part, and with a ventro-lateral one at base of claspers; segments 1, 2, 7, and 8 ventrally below, with a transverse row of four more or less shiny prominences bearing short, yellowish to brownish setae, the lateral ones being larger and each carrying 2 to 3 setae, the medial ones each with a fine and short seta; segments 8 and 9 ventrally each with four smaller shiny prominences, each bearing a single seta, the lateral ones being stouter, longer, and dark.

Locomotory Appendages.—The three pairs of thoracic legs bearing pale setae, a stouter and longer one behind and three shorter inner ones on each basal joint, with two setae on inner side of third joint, a crown of about 6 or 7 setae towards apex of joint 4, of which four are on the inner side, with three small ones round apical part of tarsus, with the exposed part of joint 2 without any setae; prolegs on segments 3–6 with three yellowish setae antero-laterally on a basal prominence, the lateral one the longest, with the planta flat below, rounded and broader than the neck of pedecil just below it, with the crochets arranged biordinally, the circle not being complete, with a gap on the outside, the circle being a little more than a semi-circle, the arrangement thus approaching a penellipse more than a mesoseries; claspers with two basal setae and one apically behind, one basal and one apical on the outer side, and two basal and two apical ones in front, all on the enlarged basal part, with the crochets arranged in a biordinal mesoseries.

Order DIPTERA.

Family Tachinidae.

Subfamily Tachininae.

Gen. *Sturmia* Desv.

S. inimica n. sp., 1 ♀.*

Body black, shining, with the usual silvery-whitish dew-like bloom on the head, mesonotum (where it is absent from four longitudinal bands), apical half of scutellum, the basal halves of segments 2–4 of abdomen above, the pleural regions, the basal halves of abdominal segments 1–4 below, the anterior coxae and the outer inner and lower surfaces of the femora; antennae dark blackish-brown, with the inner upper surfaces of joint 2 and more or less the basal and inner upper faces of joint 3 pallid, yellowish; the maxillary palps yellowish, only slightly darkened basally; mouth-opening pallid; a broad central band on vertex, from ocelli to antennae, dark velvety-brown; proboscis with the apex brownish; halteres yellowish-brown; calyptron, alula, and squama whitish; wings hyaline, translucent, the costal vein and apical parts of the other veins dark blackish-brown, their bases more yellowish; the hairs on the occipital region and on the jowls snow-white; the macrochaetae and other bristles on the body and legs black.

Head slightly broader than the mesonotum across humeral calli; vertex about five times as broad as the two posterior ocelli are from each other, more or less plane medially, with 4 post-vertical bristles, with 2 vertical ones on each side, the inner ones the longest, and apically slightly directed backwards, with the row of frontal bristles on each side extending to about opposite aristal insertion on joint 3, composed of 7 bristles, the posterior one slightly more displaced towards the margin of the eye, with the second frontal bristle at the base the longest and stoutest, but shorter than the vertical bristle, with the two fronto-orbital bristles directed forwards and downwards; facial ridges more distinct basally, with two or three very fine facial bristles anteriorly; vibrissal bristles stout and crossing and with 6 bristles below these on each side; genae with about 14 or 15 minute hairs more or less in three rows, the apical row with longer hairs; ocellar region with fine separated hairs and a forwardly

* The remains of another specimen, hatched from a parasitised caterpillar, were subsequently found in a cocoon, and leave no doubt as to the identity of this Tachinid.—Author.

projecting ocellar bristle on each side; post-orbital bristles the longest just behind eyes, small towards the jowls; antennae with joints 2 and 3 combined about as long as vertex, with 4 short bristles in a row along the anterior margin of joint 2, with joint 3 more or less laterally compressed, concave towards the apex on inside, more or less equally broad throughout its length, the apex rotundately rounded, but more acute, subangular at upper apical angle, a little more than twice as long as joint 2, pubescent and more greyish on the outer surfaces, with the arista about as long as joints 2 and 3 combined, its basal half thickened and its apical half fine and slender, with the basal joint about one-fourth the length of the thickened part and inserted at a little less than one-fourth the length of joint 3 from its base, with the thickened half of the arista finely pubescent and the apical part with minute alternate hairs, the basal joint with a single short bristle near the apex along the upper outer margin; proboscis about as long as face (side view) from base of joint 1 of the antennae to vibrissal bristle, much shorter than head is deep, with the hairs on the apical part yellowish; maxillary palps with the apical parts thickened, club-shaped, and with 2 distinct bristles on lower side of each near base of the apical part.

Thorax with 4 macrochaetae on the humeral callus, with the acrostichal and dorso-central series on each side above not so well developed as the post-humeral, supra- and intra-alar ones; scutellum with 4 macrochaetae on each side along hind margin, the basal ones being very powerful and the third on each side long and slender, longer than prescutum and scutum combined, the fourth or apical one on each side is short; mesopleurae with 6–7 macrochaetae along hind margin and some more slender bristles; sternopleurae with 3 bristles, one posteriorly and two medially; propleural region above the front coxae with an upper and a lower macrochaeta; pteropleurae with a solitary bristle along its upper margin; wings with the combined vein (radial 4 and 5) straight to apex and there very nearly touching the oblique first medial vein, which is nearly straight, slightly wavy, joining the main medial at right angles (the fifth radial cell is thus only slightly open apically on costal margin), with the oblique fourth medial vein only slightly S-curved and joining the medial vein at about a little less than apical third of the distance of fifth radial cell on the medial vein.

Abdomen with the 2 medial bristles on segment 1 not very distinct and not well developed, those on segment 2 stout and straight, directed slightly backwards, with 8 marginal ones on hind margin of segment 3, of which the four discal ones above are very stout, straight, and powerful, the two medial ones being the longest and the extreme lateral ones above the shortest; the last segment with the bristles arranged more or less in three transverse, irregular rows above, the basal row composed of smallish bristles, the second row of about 8 stouter bristles, of which the two medial ones are the stoutest, the third row composed of two medial ones not so stout as those in front and two or three lateral ones on each side; venter with segment 3 having a transverse row of longer bristles along the hind margin, with numerous downwardly directed bristles on the ventral part of segment 4, of which the discal ones are the stoutest.

Legs with longish slender bristles, more or less in rows along the lower outer part of the anterior coxae, those on middle ones more slender and more in a row; femora with the bristles on the upper surfaces of the front ones comparatively stout and long, and with 7–8 slender, straight bristles along the lower hind margin of the front ones; tibiae with a single long bristle beyond the middle along the outer lower margin on the front ones, with two powerful bristles before the middle along the anterior lateral face and a single much stouter one beyond the middle on the posterior-lateral faces of the intermediate tibiae, with the spines below on the hind ones more developed than those on the front tibiae, with one spine at about the middle of the outer series and another at about the middle of the inner series longer and stouter than the rest.

Length about 5½ mm.

Length of wing about 5 mm.

Distribution: Somerset West, C.P., April 1932. Caught sitting over the head of a caterpillar of *Phlyctaenodes plumbatalis*.

The type specimen is in the South African Museum.

Superficially this new species resembles *S. atropivora* R. Desv. and *S. bimaculata* Hart. It differs from *atropivora* in being comparatively smaller, in having a comparatively longer third antennal joint, less rotundately rounded apically and more angularly produced along the upper apical angle; the thickened part of the arista is less extensive, not extending beyond middle of arista; the second joint of the antennae is longer too and with smaller bristles above; the fifth radial cell of the wings is practically closed on the costa and not wide open, the main medial vein is faintly continued beyond oblique first medial; the macrochaetae on last abdominal segment above are fewer, less stout and the segment is more angularly rounded apically. From *S. bimaculata* it differs in having a comparatively shorter and broader third joint of the antennae, with fewer and more slender bristles in a row on each side below and behind vibrissal ones, fewer bristles on the maxillary palps; with the oblique first medial vein sharply at right angles to main medial vein, also with the fifth radial cell more closed on costal margin; the marginal macrochaetae on segment 3 of the abdomen above much longer, the bristles on disk of the last segment fewer and comparatively less stout and the segment more angular apically; the middle tibiae with 2 distinct long bristles before middle on the anterior lateral face, etc.

The larvae of this Tachinid is parasitic in the bodies of the caterpillars of the Pyralid *Phlyctaenodes plumbatalis.*

Eggs.—The eggs are deposited and glued on the outside of the caterpillars. The usual number of eggs laid on a single caterpillar is four, three of which are glued on in a triangle behind the head on the pronotum and mesonotum, and one either above the claspers posteriorly or on the side of the body opposite one of the prolegs.

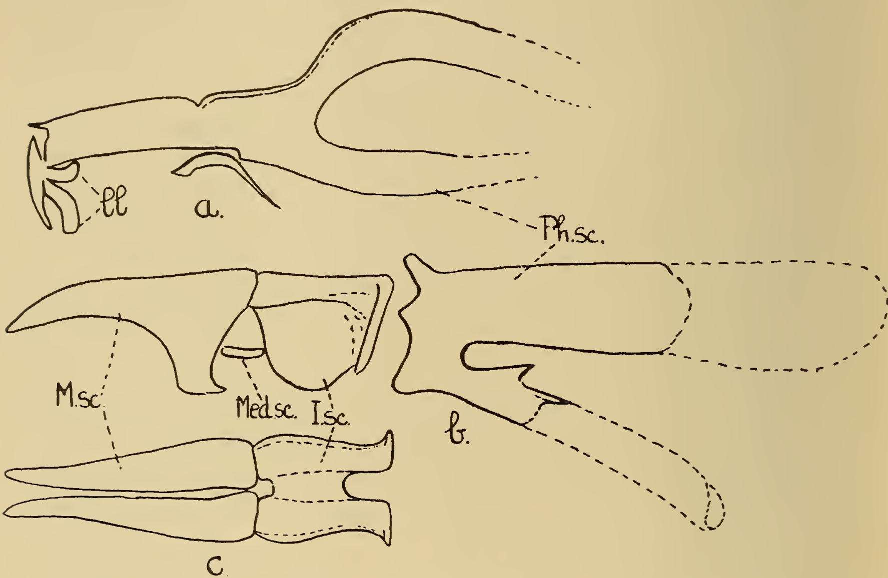
The egg itself is oval, white, shining when fresh, flattened on one side, convex on the other, glued on to the cuticle of the caterpillar by the flattened side.

Length about $\frac{1}{2}$ mm.

Larva.—The ensuing larva perforates the egg-shell on the glued-on side nearer one pole, where it makes a small circular hole. It may remain attached to this perforation for some time, or it may leave this position and migrate elsewhere, making a new communication with the exterior (see general part).

Body dirty white; the apical part slightly darker; cephalopharyngeal skeleton visible through the anterior part of the body as a black rod. The very young stage, about 1 mm. long, probably representing the first instar, shows no distinct or visible segmentation, but with 12 transverse circlets of minute, microscopic spicules, of which circlets 1 and 2 in the cephalic region are much broader, composed of larger, denser and broader, more flattened spines; row 3 also broader than the posterior ones and with slightly larger spicules; with a cluster of about 5 or 6 larger, more elongate spines, more or less arranged in an arc, one on the ventral side and another on the dorsal aspect at the posterior end, the two middle spines in each cluster being slightly larger; with the rudiments of the posterior spiracles, just below the dorsal cluster of spines, visible under a high power as a tracheal tube ending in the cuticle on each side and showing three indistinct, dark chitinous areas (the future spiracular openings).

Cephalic End narrower and more attenuated, no distinct oral aperture visible as yet; cephalo-pharyngeal skeleton (text-fig. 8, *a*) is a double structure from behind the mandibular sclerites, resembling a tuning-fork; the mandibular sclerites (M.Sc.) seem to be composed of a central piece and two lateral lobes (L.L.) on each side; the cephalo-pharyngeal skeleton of a last instar (text-fig. 8, lateral view *b* and dorsal view *c*), obtained from a puparium, is totally different,



TEXT-FIG. 8.—Cephalo-pharyngeal skeleton of larvae of *Sturmia inimica* n. sp.

and yet there is no doubt that it belongs to the larva of the same fly; with three divisions present, the mandibular sclerites (M.Sc.) as in figure, the intermediate sclerite (I.Sc.) being joined transversely below, and the pharyngeal sclerite (Ph.Sc.), which has a small process anteriorly and dorsally, beyond this the upper part is divided into two wings, the apical halves of which are not completely chitinised, whereas the lower part is not divided, trough-shaped and with a small dentate process basally on each side, with the apical part also incompletely chitinised; a minute, medial, rod-like sclerite (Med.Sc.) is visible ventrally between the mandibular and intermediate sclerites.

Posterior End in the very young stage (about 1 mm. long) blunt, with the posterior fourth bent or curved and the posterior sixth or seventh fitting into a dark chitinous, socket-like or capsule-like ring in the cuticle of the caterpillar. (This chitinous ring probably represents a sheath in part and also the modified cuticle of the host. The larva is very loosely lodged in this socket, and probably adheres by means of its posterior circlet of spicules or by means of the dorsal and ventral clusters of larger spines.) The advanced stage or last instar has not been studied, but judging from the empty cuticle of the host in the cocoon-case it probably becomes free and feeds on the vital parts of the host. Pupation takes place in the cocoon-case of the host or possibly in the soil also, depending on the extent of the infection and on the period of parasitism prior to pupation on the part of the host (see general part). Only a single parasite is destined to pupate in any one caterpillar.

Puparium.—The puparium is reddish-brown, slightly darker at the ends, broadest near the apical end and at the middle; the cephalic end being broader than the posterior end, broadly and rotundately rounded, with a slight depression in the middle apically, marking the position of the larval mouth, with striae radiating from it and with a feeble, carinate raised line extending from the mouth nearer the dorsal aspect on each side for a short distance, and bearing, on each side near the mouth, a short, cylindrical process (the former anterior spiracles of the last larval instar); the posterior end gradually narrowed from middle to near the anal part, where it is rapidly narrowed, ending in a rounded black boss-like tubercle, the tubercle with a central foveate puncture and another one on the periphery on the dorsal aspect, from which there extends a short cicatrice-like depressed line; three small, oval, raised, shining black prominences on each side dorsally just above the anal boss (the former posterior spiracles of the last instar); anal aperture of the last instar represented by a circular depression on the midline ventrally near the posterior end.

The shape is elongate, slightly dorso-ventrally compressed apically, cylindrical posteriorly, indistinctly segmented, very finely and more or less transversely striated, the cephalic and posterior ends being more coarsely rugulose in sculpture.

Length about 6 mm.

Breadth about $2\frac{2}{3}$ mm.

The period of pupation as well as the periods of the larval instars are as yet unknown.

Order THYSANOPTERA.

Suborder Tubulifera.

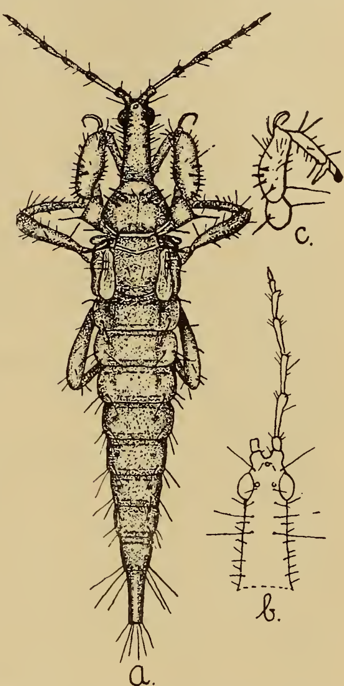
Family Idolothripidae.

Gen. *Dicaiothrips* Buffa.

D. gnidiicolus n. sp., 5 ♂♂, 5 ♀♀ (text-fig. 9, ♂).

Body more or less shining black; antennae deep brownish-black to black; joint 2 of the antennae (apex excepted), the sickle-shaped bristle on apex of front femora in the ♂, the apices of the tibiae (variable in extent), the basal joint and tooth-like spine on the anterior tarsi of the ♂, stramineous or yellowish; the setae on the abdomen and the hairs on the legs whitish or sericeous; the trochanters and extreme bases of the femora, the articulating membranes between the abdominal segments shining through more or less reddish to pale yellowish-red; the wings whitish, translucent.

Head elongate, about $\frac{2}{3}$–1 mm. long above in the ♂, slightly shorter in the ♀, about three times as long to apex of antennal tubercles as broad basally, very slightly broader basally than apically, with the sides almost parallel, very gradually narrowed apically, but about as broad or only very slightly narrower across eyes than base, slightly compressed dorso-ventrally and feebly arched at about the middle, with the integument smooth, shining, with a single anteocular bristle on each side apically, a short, erect bristle behind each lateral ocellus and three postocular discal bristles on each side behind eye (the first one being short like the ocellar bristle, the second the longest, and the third only slightly shorter than the second and situated about half-way from eye to base), all less developed in the ♀; on the sides of the head there is a short stoutish spine-like bristle behind each eye, another short sublateral one near base of second large postocular and about 6–8 short bristles on each side to base, of which 2 or 3 are sublateral on each side in basal half (text-fig. 9, *b*); the produced part of the head about twice as broad as long; eyes comparatively large, convex; ocelli minute, with the lateral ones situated just before the middle of eyes and the apical one on a slight prominence only very slightly farther away from lateral ones as these are removed from each other; frons below with a fine bristle on each side on a slight prominence at base just below antennal tubercles, and another longer, whitish one on each side apically just before mouth-cone, as well as a few shorter fine ones just overhanging mouth-cone; cheeks with about 7 short spines on each side from eye to mouth-parts, with the integument shining and more or less transversely wrinkled; mouth-cone bluntly pointed, short, extending to about half the length of prosternum, with a few fine hairs basally in front of the maxillary palps and a few fine ones below apex; labial palps minute; antennae 7-jointed in both sexes, extending to about wing-bases in the ♂, comparatively shorter in the ♀, about reaching posterior margin of pronotum, with joint 1 sub-equal to 6, with joint 2 the longest and 3–5 progressively shorter, with joint 5 slightly produced apically on lower margin, with 7 the shortest and acuminate; in the ♂ with joints 6 and 7 combined subequal to 5 along upper margin, the last 3 joints subequal to 1 and 2 combined; in the ♀ with 5 about half as long as 2, and 6 and 7 combined subequal to 4.



Text-fig. 9.—*Dicaiothrips gnidiicolus* n. sp. (♂.)

Thorax with the pronotum more or less hexagonal, the base and the postero-lateral sides being more or less straight and carinate, with the apical margin arcuately rounded and the antero-lateral sides broadly rounded; the upper surface slightly transversely depressed in apical part, quadrangularly convex discally, less so in the ♀, with a feeble indication of a central depressed line, more evident posteriorly, with the integument smooth, shining, minutely and microscopically punctured centrally and discally, smooth apically, with 10 distinct spines on the disk, more developed in ♂, five on each side (a small bristle-like spine medially near apical margin, another longer and stouter backwardly directed one laterally in line with the medial one, a longer backwardly directed one laterally on a slight prominence just before middle, an equally stout one postero-laterally and a very fine, erect hair-like one centrally before the base); a postero-lateral plate is present on each side basally above the coxae, each with a small prominence carrying a stout, outwardly and backwardly projecting spine; pterothorax subequal to or slightly shorter than the pronotum, basally broader than the pronotum, the extreme base or mesonotal and mesopleural part deeply cut off from the posterior part, the sides projecting and prominently carinate; mesonotal part demarcated from metanotal part by a transverse, posteriorly arcuate, carinate ridge, the ridge laterally on each side at base of wings with a stout, erect spine; metanotal region slightly convexly raised in the middle and there with 2 small central bristles, with the integument dull, shagreened like the mesonotal part, with the hind margin rotundately rounded; wings with the tegmina abbreviated, short, narrow, about $\frac{1}{3}$ mm. long or less, about as long or very slightly longer than joints 1 and 2 of the antennae combined, just extending over hind region of mesonotum, broader apically, with the apical margin rounded, with the internal and external margins feebly sinuous before the middle near base, whitish, translucent, and with only one vein from base to beyond middle along outer margin, the vein pale brownish in basal half and carrying two erect bristles before the middle (the posterior one longer), without any fringe of ciliary hairs; hind wings as long as tegmina, but narrower, with an indication of an outer vein in basal half.

Abdomen elongate, about one and a half times as long as head and pronotum combined, with the first five or six segments depressed above, the sides slightly reflected upwards (much less evident in spirit specimens and scarcely shown in text-fig. 9, *a*, which was drawn from a spirit specimen), about as broad or slightly broader than the pterothorax, smooth, shining, gradually narrowed to the tube; segments 2–7 with two long, upwardly and slightly inwardly directed bristles laterally on each side at apex and with a transverse row of separated bristles on hind margins of the sternites below; segment 1 in the ♂ is dorsally scarcely visible, in the ♀ more distinct, its posterior margin arcuately rounded; segment 8 more cylindrical, with the transverse row of bristles very nearly approaching the midline above; segment 9 shorter than 8 (shown longer in the figure, owing to extreme distension), cylindrical and with a transverse row of much longer bristles dorsally and laterally along hind margin, ventrally below in the ♂ with two straight, stouter spines just before the genital aperture; tube about half as long as head, about $\frac{1}{2}$ mm. long, more or less cylindrical, broadest at base, gradually tapering to apex, with a crown of 6-7 bristles, shorter than the tube and slightly shorter than those on segment 8.

Sternum with a few fine whitish hairs on each side and one on each side opposite the coxae; the mesosternal part broad, with the middle coxae further apart than the posterior and anterior ones; front coxae well developed, enlarged, and visible from above, more developed in the ♂, with a stout, outwardly directed spine-like bristle laterally, stouter in the ♂.

Legs with the anterior femora powerful and incrassate in the ♂, less so in the ♀, subequal in length to the head and very nearly as broad (in ♂), viewed from the side (text-fig. 9, *c*) slightly arched, unarmed below, in the ♂ obliquely truncated apically, armed with short, stoutish, erect spines and larger, more slender bristles above and on the sides (arranged as shown in text-fig. 9, *a* and *c*), with the inner apical part slightly produced and bearing a stout, curved sickle-shaped yellowish bristle; in the ♀ there is no apical sickle-shaped bristle and the bristles are less developed, but in both sexes there is at the base ventrally a very long, slender, hair-like bristle (text-fig. 9, *c*) and also a shorter one on the coxae; middle and posterior femora with short, separated bristles and with a solitary long hair-like bristle near base below; tibiae with the anterior ones in the ♂ incrassate, shorter than the femora, straight, constricted basally, forming a sort of knee-prominence near the base, which carries two long bristles, with a small prominence ventrally below near apex bearing a bristle and a similar one laterally near apex, the rest of the bristles short; tarsi 2-jointed, with the first joint of the anterior ones in the ♂ provided with a straight, stout, yellowish tooth below, very nearly as long as the entire tarsus in some ♂♂ and much longer than the tarsus is broad, the ♀ without a spur, but often with a very feeble protuberance.

Length about $2\frac{1}{2}$–4 mm. (The latter distended specimens in fluid.)

Breadth about $\frac{1}{2}$–$\frac{2}{3}$ mm. across pterothorax.

Distribution: Somerset West, C.P. (Coll. September–October 1931, April 1932.)

The ♂ holotype and ♀ allotype in spirit.

This Thrips, which inhabits and breeds in the empty galleries of *Hoplitopales lineatus* in the thickened stems of *Gnidia laxa*, differs, according to the descriptions, from all other African species of *Dicaiothrips* in the extremely abbreviated condition of the wings, in the different arrangement of the bristles and spines on the head and femora. From *D. drepanifer* Faure, the only other South African species described, it differs, according to the description, in the longer head, different arrangement of the bristles on the head and pronotum, much shorter wings, different shaped and yellowish sickle-shaped bristle on the anterior femora of the ♂, longer spur on anterior tarsus of the ♂, etc. The abbreviated condition of the wings, which are quite useless for purposes of flight in this species, is probably an adaptation to the cryptic habits of this and similar species. This Thrips is probably not confined to *Gnidia*, but may possibly also inhabit other dark environments, crevices, under bark or leaves, etc.

The whole life-history is passed in the empty galleries in the damp frass of the Curculionid larvae.

Egg (text-fig. 10, *a*).—The eggs are white, laid in clusters but not close together, about equally distant apart, glued on along their longitudinal axis, pointing upwards with one pole; the one pole being more rounded and the other slightly more attenuated, broadest just beyond the middle and in outline slightly curved, the surface smooth, not sculptured.

Length about $\frac{4}{5}$ mm.

Larvae (text-fig. 10, *b* and *c*).—The larvae are pink or ruby-red in life, the very young stages being more pink; the antennae (excepting the extreme apices), the apical part of the head and head below, the small eye-spots, a small chitinous area on each side of head behind the eye-spots, the two quadrangular plates on the pronotum, the spots or bases of the setae on the dorsal part of the body, the chitinous plates on each side of segment 8, the tube or last two segments, a row of ventral spots on each side of the midline and the legs dark brown to blackish in life.

Head with chitinous plates as shown in the text-figure; antennae with 7 joints (actually 6-jointed, the first being the antennal tubercle), with the second joint the longest, with 3 slightly shorter than tubercle and joint 1 combined, with 4 slightly shorter than 3, with 5 very slightly longer than 6 and shorter than 4, with joint 6 styliform; eyes represented as spots and there is another solitary spot in the middle between the chitinous plates above.

Thorax with the pronotum narrowed in front, broadest just behind the middle, with a large quadrangular, dark-coloured plate on each side discally above; meso- and metanotum not much different from the abdominal segments, the setae and spots arranged as in text-figure.

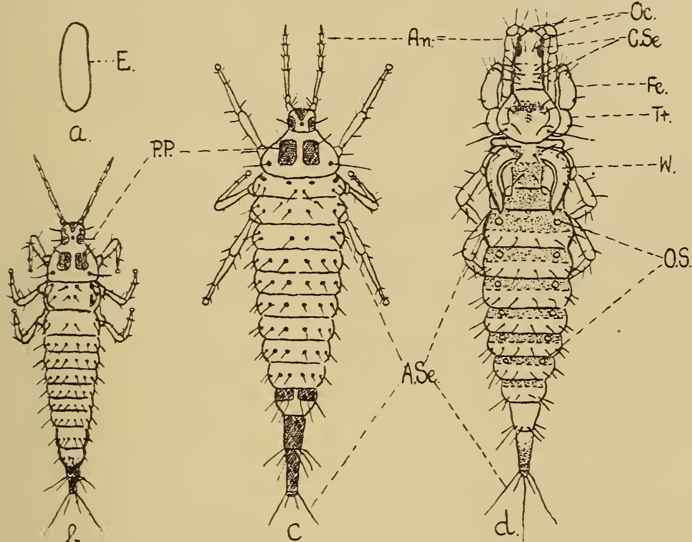
Abdomen narrowed from segments 7–10, the last two being tubular (in advanced stage), each segment with a transverse row of separated spots (the bases of the setae) at about the middle, of which there are 6 dorsally, one laterally, with a ventral row of spots below on each side (two on a segment) and also on the sterna, with, however, another lateral spot on each segment from segment 7; segment 8, in advanced stages, with a broad basal plate present, which is interrupted in the middle (text-fig. 10, *c*); the tube is already distinct and much longer in advanced larvae.

Legs as shown in the figures, the terminal vesicle well developed; tarsi apparently 1-jointed.

Length of advanced larva about $3\frac{1}{4}$ mm.

Breadth of advanced larva about $\frac{4}{5}$ mm.

The number of moults is unknown, but there are probably three; the very young stages do not differ very much from the last stage,



TEXT-FIG. 10.—Egg, larvae, and pupa of *Dicaiothrips gnidiicolus* n. sp.

the tube is shorter, the antennae are less differentiated, and the eighth segment has no dark chitinous basal ring. The thoracic segments are comparatively longer and less differentiated.

PUPA (text-fig. 10, *d*).—The young pupa is pinkish and the advanced one white; the eyes and the tube blackish; the eyes, ocelli, and last segment of the advanced pupa black; the basal transverse bands on the dorsal parts of the abdominal segments, the dorsum of the meso- and metanotum and an indistinct patch on the pronotum brownish.

Structurally the pupa resembles the adult. The *Head* is much broader than long, with the apex attenuated, with 3 setae on each side above as shown in the figure; eyes distinct; ocelli with the lateral ones just anterior to the eyes and the third at apex just between the antennal insertions; the antennae segmented and flexed under the head, their apices meeting near mouth below.

Thorax with the pronotum already subhexagonal, broadest and more rounded just behind the middle, with the setae distributed as shown in the text-figure; wings short as in the adult, the apices not extending beyond base of segment 2 of abdomen.

Abdomen broad basally, with 9 visible segments and a tube, attenuated from segment 7 to apex, each segment with a basal transverse, more chitinised, dark band, with a clear ocellate spot (O.S.) on each side from 1–7, with the setae distributed as shown in the text-figure (A.Se.); the sternites with the apical margins of the first five segments narrowly and darkly chitinous.

Legs with the anterior femora already thickened as in the adult and the setae more or less arranged as shown in the figure.

Length about $3\frac{1}{2}$ mm.

Breadth about $\frac{5}{6}$ mm.

Distribution: Somerset West, C.P. (coll. September–October 1931, April 1932).

The pupa is capable of movement, and when disturbed was seen to crawl away with such rapidity that it was at first mistaken for some other insect.

All the type material in the South African Museum.

BIBLIOGRAPHY.

The following are some of the chief works consulted:—

Bottomley, W. B. Proc. Roy. Soc. (B.S.), vol. lxxxix, pp. 481–507.

Brain, C. K. Insect Pests and their Control in South Africa, pp. 126–144.

Brues, C. T. "Studies on Ethiopian Braconidae," Proc. Amer. Acad. Arts and Sc., vol. lxi, pp. 205–435. 1925–26.

Brues, C. T. Ann. S. Afr. Mus., vol. xix, pp. 14–17.

Coquillett, D. W. "Revision of the Tachinidae of America," U.S. Dep. Agric. 1897.

Faure, J. C. "S. Afr. Thysanoptera," S. Afr. Journ. Nat. Hist., vol. v, pp. 143–166. 1925.

Handlirsch, A. Handbuch der Entomologie, Lief. 21, p. 172. 1926.

Hinds, W. E. "North American Thysanoptera," Proc. U.S. Mus., vol. xxvi, pp. 79–219.

Imms, A. D. Textbook of Entomology, pp. 402–409. 1925.

Karny, H. "Thysanoptera," Treubia, vol. i, pp. 211–269. 1921.

Marshall, G. A. K. "Curculionidae," Faun. Brit. India. Coleoptera, pt. i, pp. 17–25. 1916.

Marshall, T. A. "Braconides," Hym. d. Europe, vol. iv.

Perris, E. Ann. Soc. Ent., Fr. ix, pp. 1–32. 1840.

Rübsamen, E. H. "Gallbildungen," Handbuch der Entomologie, Lief. 21 and 22, Kap. 2, pp. 219–248. 1926.